Patent 0-03-152 (14825/US/02)

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Inventor: Slatkine
Serial no.: 10/614,672
Filed: July 7, 2003
Title: METHOD AND APPARATUS FOR IMPROVING SAFETY DURING EXPOSURE TO A MONOCHROMATIC LIGHT SOURCE
Examiner: Jerry T. Rahll
Art Unit: 2874

Response and Amendment

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir/Madam:

In response to the outstanding Office Action mailed on January 30, 2006, regarding the above-identified patent application, the applicant responds as follows:

1. In response to paragraph 3 of the Office Action, the abstract was amended, as set forth page 30, however, to assist the examiner the applicant provides the following clean version of the amended abstract:

> A method and apparatus are disclosed for improving bodily safety during exposure to an eye hazardous monochromatic treatment light source by diverging the light, such as with a diffusing unit attached to the light source distal end so that the radiance of the light exiting the distal end is an eye safe level. At a first position of the light source distal end substantially in contact with an outer surface of a target, the energy density of an exit beam from the distal end is suitable for effecting a desired treatment, and at a second non-contact position of the distal end the exit beam energy density is significantly less than a value suitable for effecting the treatment. In an additional embodiment, the diverging or diffusing unit has a device for evacuating vapors or particles from the target.

2. A set of amended claims is attached herewith and begins at page 7, to better define the invention. In addition to the previously presented independent claims, claims 6, 41, 57, 75, 80, 119, and 120 are now in independent form. Claims 2-5, 8, 16, 21-22, 26, 43-44, 50, 53, 55-56, and 77 have been canceled. Claims 93-121 have been added. In addition, claims 27 to 35 and 82 to 92 have been canceled in view of the restriction requirement. We also include a fee transmittal sheet – originally paid for 92 claims and 7 independent claims; present claims are 84 claims and 10 independent claims – for the three additional independent claims.

3. Original claims 1-5, 7-19, 21-26, 36-40, 42-56,59-70, 73-74, 79, and 81 are rejected as being unpatentable over US 2002/0034012 (Santoro et al). It is respectfully submitted that the amended claims are new and non-obvious in view of the cited reference.

4. Santoro et al relates to kinoform diffusers that exhibit controllable diffusion characteristics that include off-axis transmittance and reflectance properties, elimination of zero-order beam, and freedom from spectral dispersion under achromatic illumination. Light control devices for artificial illumination and day-lighting applications implemented with such kinoform diffusers provide anisotropic luminous intensity distributions with minimal glare and high luminaire efficiencies.

While the light control device of Santoro et al is intended to improve the lighting conditions, and to reduce the glare, of light propagating in free space, particularly achromatic light, the apparatus of the present invention is intended to reduce the efficacy of collimated eye hazardous monochromatic treatment light delivered from a monochromatic light source and traveling in free space, and to diminish its radiance to an eye safe level.

The monochromatic light efficacy is preserved only if the light source distal end is substantially in contact with a target. The radiance of the monochromatic light is reduced to an eye safe level by means of a diverging unit, e.g. a diffusing unit, attached to the light source distal end, as recited in claims 1, 6, 25, 36, 41, 57, 75, 80, 119, and 120 of the present invention, such that at a first position substantially in contact with a target the

energy density of light exiting the diverging unit is suitable for effecting a desired treatment, e.g. below a skin surface, and at a second position distant from the first position the energy density of light exiting the diverging unit is significantly less than a level which is suitable for effecting the desired treatment.

While the light control device of Santoro et al changes the intensity distribution of the light propagating in free space in order to improve the lighting conditions, the apparatus of the present invention dramatically reduces the energy density of the propagating monochromatic light to an ineffective level, which is of no use to an operator, patient, or bystander, when the light source distal end is held at the second position.

5. The kinoform diffusers of Santoro et al are disclosed as being associated with a specific technology that is intended to produce a beam distribution that is contained within a controllable range of angles which is advantageous for illumination purposes. A diffusing unit of the present invention, in contrast, need not be defined with respect to a precise beam distribution since skin strongly scatters light that is impinged thereupon, and when an aesthetic or medical treatment is performed as the light source distal end is disposed at a first position substantially in contact with the skin target, as recited in claims 1, 25 and 36, the dominant scattering effect is by means of the internal scattering within the skin. The scattering effect of the diffusing unit of the present invention, as recited in claim 1, is of importance when the light source distal end is disposed at the second position relative to the skin target, in order to reduce the radiance of the light exiting the diffusing unit to an eye safe level.

6. Santoro et al does not recite or even suggest the suitability of a light control device which employs a diffusing unit comprising one of the claimed kinoform diffusers for reducing the radiance of monochromatic light exiting the diffusing unit to an eye safe level, as recited in claims 1, 25, 36, 75, 119, and 120 of the present invention. Eye hazardous monochromatic light is generated by high intensity lasers for use in aesthetic or medical treatments and not for illumination. A particular manufacturing method, including a unique beam distribution, for reducing the radiance of monochromatic light

exiting a kinoform diffuser of Santoro et al to an eye safe level, which is not disclosed in Santoro et al, would have to be specified.

7. Santoro et al does not recite or even suggest the suitability of a light control device which employs a diffusing unit comprising one of the claimed kinoform diffusers for effecting a desired treatment with an eye hazardous monochromatic treatment light source, as recited in claims 1, 6, 25, 36, 41, 57, 75, 80, 119, and 120 of the present invention. The light sources recited in Santoro et al are not disclosed as being suitable for any of the treatments disclosed in the present invention, particularly those that are recited in claims 17, 51, 107, 119, and 120 of the present invention, but rather the light sources recited in Santoro et al are used for illumination purposes.

8. Even if a light control device of Santoro et al which employs a diffusing unit comprising one of the claimed kinoform diffusers were used to effect a desired aesthetic or medical treatment, as recited in claims 1, 25, and 36, the light control device of Santoro et al is not suitable for such treatment since a light control device provided with a transmitting element substantially in contact with the skin target is not recited or even suggested.

The kinoform diffusers of Santoro et al are surface relief patterns applied to transparent optical elements. The diffuser will lose its diffusion properties if placed in contact with moist skin on which is applied for example cooling gel. In contrast to the present invention which is provided with a transmitting element substantially in contact with a skin target, as recited in claims 6 and 57, the light control device of Santoro et al needs to be positioned distant from the skin target due to the lack of a skin contacting element, and therefore the energy density of the scattered monochromatic light exiting a diffusing unit of Santoro et al would be less than the level which is suitable for effecting the desired treatment due to the distance of the kinoform diffuser from the skin target.

Although Santoro et al recites that relief patterns may be applied to both surfaces of the transparent optical elements, Santoro et al does not disclose, or provide any means to ensure, that the distal end of the light control device of Santoro et al be separated from a skin target by a distance of less than 2 mm or one-tenth of the diameter of a light beam

exiting the diverging means, as recited in claims 67 and 121, respectively, of the present invention.

9. Even if a kinoform diffuser of Santoro et al were provided in a diffusing unit exposed to eye hazardous monochromatic treatment light, there is no suggestion that the kinoform diffuser is able to withstand the high peak power levels characteristic of eye hazardous high-intensity monochromatic pulsed laser treatment light. Moreover, the kinoform diffusers of Santoro et al are microscopic surface relief patterns produced by various manufacturing methods, as recited in paragraph 0187 of Santoro et al, such as embossing and lamination of films on a glass or plastic substrate. The diffusing properties of a kinoform diffuser of Santoro et al, when being absorbed by an eye hazardous monochromatic treatment light, are liable to be changed as the microscopic surface relief patterns melt or are otherwise modified. A particular manufacturing method to enhance the durability of a kinoform diffuser of Santoro et when exposed to eye hazardous monochromatic light, which is not disclosed in Santoro et al, would have to be specified.

In contrast, the diffusing units of the present invention have been designed to withstand the high peak power levels characteristic of eye hazardous monochromatic treatment light such as high peak power lasers, for example the diffusively transmitting element provided with a plurality of irregularities which are randomly distributed thereabout as recited in claim 58 on a high melting temperature Sapphire window or a diffusing unit provided with diffuser and skin cooling means as recited in claim 78. When the diffusing unit comprises a light guide and internally reflecting walls, as recited in claim 60 of the present invention, an inexpensive, commercially available glass or sapphire small-angle scattering diffuser may be used since the specific shapes of the much coarser diffuser irregularities are not critical and exposure to the high peak power level of eye hazardous monochromatic treatment light will not affect diffusion.

10. Santoro et al does not recite or even suggest the provision of a kinoform diffuser with means to evacuate vapors or particles from a target, as recited in claim 75 of the present invention.

11. In summation, a diverging or diffusing unit of the present invention is not intended to produce a precise beam distribution which is of importance for achromatic illumination, as is the object of the light control device of Santoro et al, but rather is intended to ensure eye safety when exposed to monochromatic light, to ensure efficacy of the monochromatic light when positioned substantially in contact with a target and lack of efficacy of the monochromatic light when positioned at a distance from said target, to serve as a heat sink while being in contact with a skin target, to withstand the high peak optical power of monochromatic light e.g. generated by high power lasers which is needed for aesthetic or medical treatments, to retain its diffusing properties while in contact with moist skin, and to evacuate vapors or particles. None of these advantageous characteristics of the present invention are recited in Santoro et al.

12. In view of the above amendments and remarks, favorable reconsideration and allowance of the application are respectfully requested.

Respectfully submitted,

Date: 4/7/06

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Date 4/7/06 Kevin D. McCarthy _____
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Fees pursuant to the Consolidated Appropriations Act, 2005 (H.R. 4818).

FEE TRANSMITTAL
For FY 2006

☑ Applicant claims small entity status. See 37 CFR 1.27

TOTAL AMOUNT OF PAYMENT ($) 300

Complete if Known	
Application Number	10/614,672
Filing Date	July 7, 2003
First Named Inventor	Slatkine
Examiner Name	Jerry T. Rahil
Art Unit	2874
Attorney Docket No.	0-03-152

METHOD OF PAYMENT (check all that apply)

☑ Check ☐ Credit Card ☐ Money Order ☐ None ☐ Other (please identify): _____

☐ Deposit Account Deposit Account Number: _____ Deposit Account Name: _____

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FEE CALCULATION (All the fees below are due upon filing or may be subject to a surcharge.)

1. BASIC FILING, SEARCH, AND EXAMINATION FEES

	FILING FEES		SEARCH FEES		EXAMINATION FEES		
		Small Entity		Small Entity		Small Entity	
Application Type	Fee ($)	Fee ($)	Fee ($)	Fee ($)	Fee ($)	Fee ($)	Fees Paid ($)
Utility	300	150	500	250	200	100	0
Design	200	100	100	50	130	65	0
Plant	200	100	300	150	160	80	0
Reissue	300	150	500	250	600	300	0
Provisional	200	100	0	0	0	0	0

2. EXCESS CLAIM FEES

Fee Description	Fee ($)	Small Entity Fee ($)
Each claim over 20 (including Reissues)	50	25
Each independent claim over 3 (including Reissues)	200	100
Multiple dependent claims	360	180

Total Claims		Extra Claims	Fee ($)	Fee Paid ($)
84	- 20 or HP =	0	x 25	= 0

HP = highest number of total claims paid for, if greater than 20.

Indep. Claims		Extra Claims	Fee ($)	Fee Paid ($)
10	- 3 or HP =	3	x 100	= 300

HP = highest number of independent claims paid for, if greater than 3.

Multiple Dependent Claims	
Fee ($)	Fee Paid ($)
0	0

3. APPLICATION SIZE FEE

If the specification and drawings exceed 100 sheets of paper (excluding electronically filed sequence or computer listings under 37 CFR 1.52(e)), the application size fee due is $250 ($125 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).

Total Sheets		Extra Sheets		Number of each additional 50 or fraction thereof	Fee ($)	Fee Paid ($)
0	- 100 =	0	/ 50 =	0 (round up to a whole number)	x 250	= 0

4. OTHER FEE(S)

	Fees Paid ($)
Non-English Specification, $130 fee (no small entity discount)	0
Other (e.g., late filing surcharge): _____	0

SUBMITTED BY

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